North Fork Salmon River Spring/Summer Chinook Salmon Population
Population Viability Assessment

The North Fork Salmon chinook population (Figure 1) is part of the Snake River Spring/Summer Chinook ESU which has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde / Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run chinook. The North Fork Salmon population is characterized as a spring run adult life history type. The population is one of eight extant populations in the Upper Salmon River MPG.

The ICTRT classified the North Fork Salmon population as a "basic" population (Table 1) based on historical habitat potential (ICTRT 2005). A chinook population classified as basic has a mean minimum abundance threshold criteria of 500 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

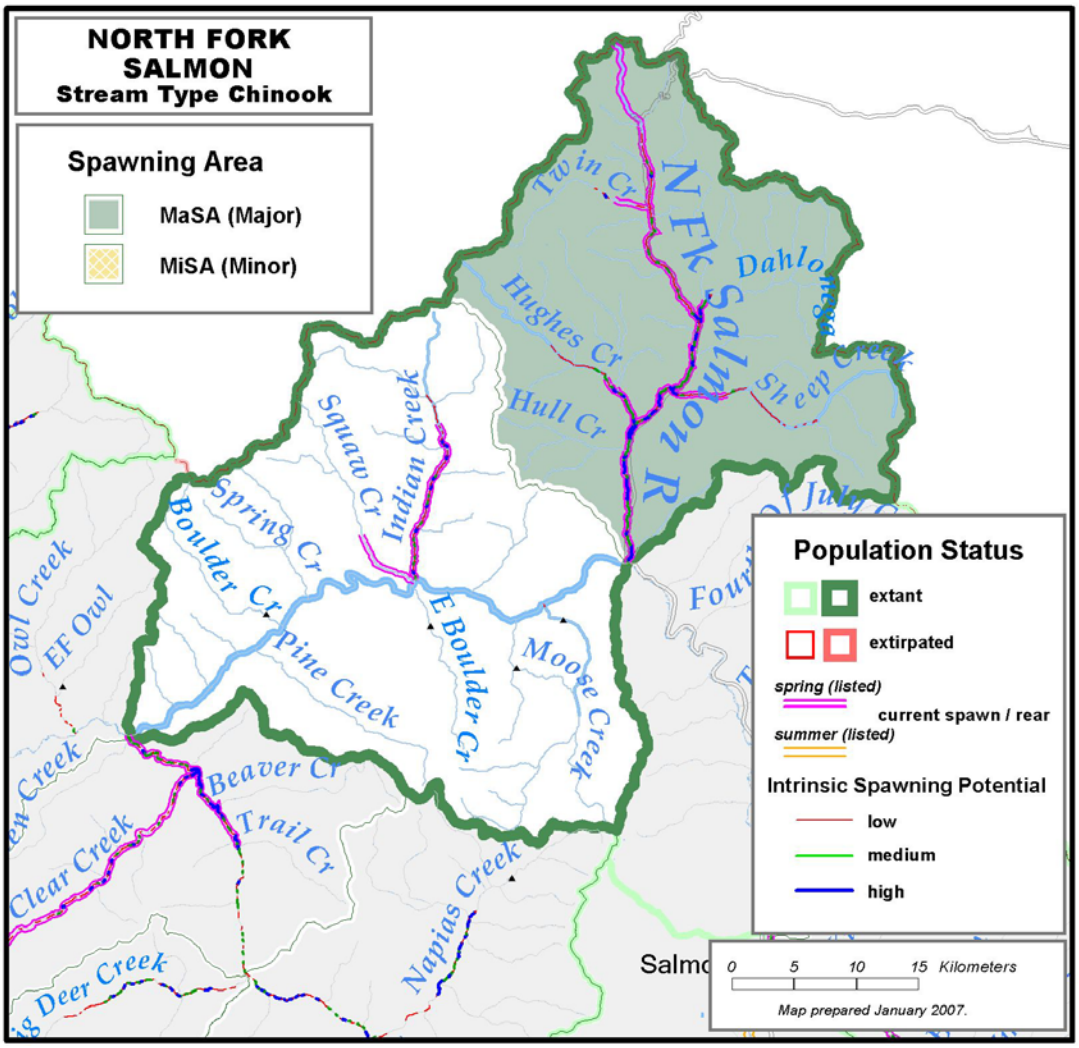

Figure 1. North Fork Salmon River chinook major and minor spawning areas.

Table 1. North Fork Salmon chinook basin statistics

Drainage Area (km2)	1,251
Stream lengths km* (total)	399
Stream lengths km* (below natural barriers)	303
Branched stream area weighted by intrinsic potential (km2)	0.124
Branched stream area km2 (weighted and temp. limited)	0.124
Total stream area weighted by intrinsic potential (km2)	0.192
Total stream area weighted by intrinsic potential (km2) temp limited	0.192
Size / Complexity category	Basic / "D" (core drainage with adj. but separate small tributaries)
Number of MaSAs	1
Number of MiSAs	0

*All stream segments greater than or equal to 3.8m bankfull width were included

**Temperature limited areas were assessed by subtracting area where the mean weekly modeled water temperature was greater than 22^{o}C.

Current Abundance and Productivity

Current natural abundance (number of adult spawning in natural production areas) is unknown for this population. Redd surveys have been conducted intermittently since 1957 on the North Fork Salmon River. No surveys are done on tributaries to the mainstem Salmon River within the population boundary. Numbers of redds counted in various reaches are reported in Table 4. The most consistent redd surveys covered the reach from the North Fork Salmon River mouth upstream to Twin Creek (earliest years) or upstream to Pierce Creek (recent years). The difference between these two reaches is only 1.5 kilometers, the distance between Twin and Pierce creeks. Over these stream reaches the median number of redds per kilometer was 4.2 during the late 1050s and early 1960s and declined to 0.2 redds/kilometer for the period 1991-1999 (Figure 5). Recent (2001-2006) median density was 1.3 redds/kilometer.

Spatial Structure and Diversity

The ICTRT has identified one major spawning area (MaSA) and no minor spawning areas (MiSAs) within the North Fork Salmon chinook population. There are no modeled temperature limitations within this MaSA. Spawning distribution is known only within the North Fork Salmon River drainage; no surveys are conducted outside of that area. It appears, from a review of individual transect counts (Table 4), that most redds are typically located in the reach from Hughes Creek to Twin Creek.

Factors and Metrics

A.1.a. Number and spatial arrangement of spawning areas.
The North Fork Salmon River spring/summer Chinook salmon population has one MaSA and no MiSAs. The total branched stream area weighted by intrinsic potential is 124,000 m2. This metric is rated *High Risk* because the area outside of the one MaSA does not represent more than 75% of the capacity of a MaSA.

A.l.b. Spatial extent or range of population.
Current utilization of habitat for spawning and rearing is inferred from spawner redd counts and juvenile presence/absence and density surveys. This metric is rated *Very Low Risk* because current spawning distribution mirrors historical within the MaSA.

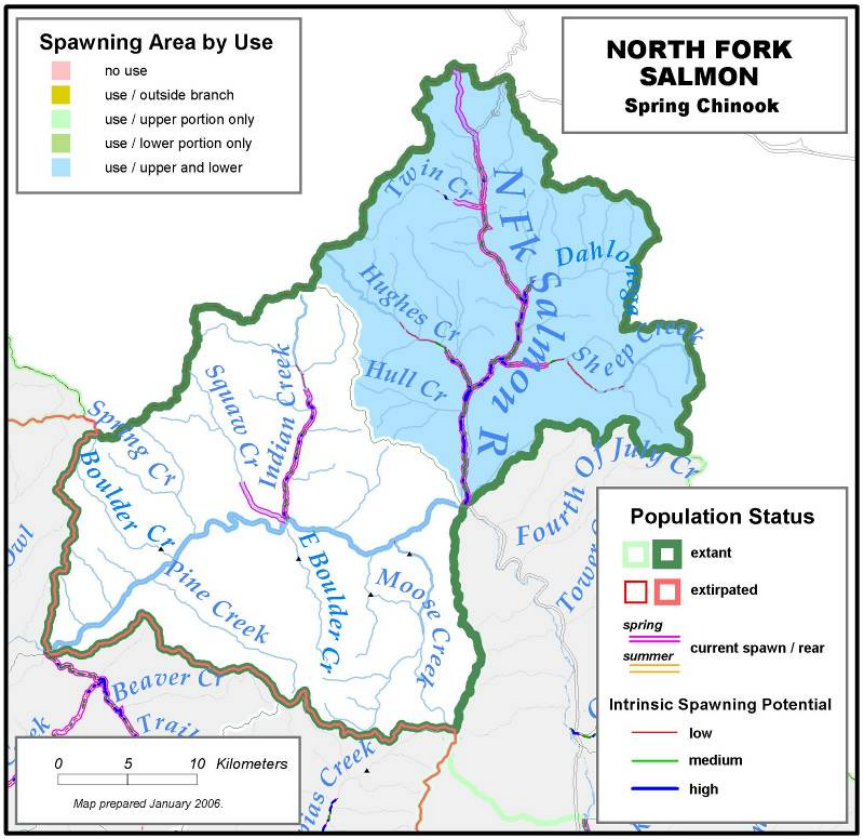

Figure 2. North Fork Salmon chinook distribution.

A.1.c. Increase or decrease in gaps or continuities between spawning areas.
There has been no change in gaps when comparing current and historical spawning distribution. The population is rated at *Low Risk* because the historical MaSA is occupied, gap distance and continuity have not changed, and there has been no increase in distance between this population and other populations in the MPG or ESU. This is the lowest risk rating achievable for this metric since the population did not historically contain more than 2 MaSAs. Although gaps or continuities between spawning aggregates within the population have not changed, lack of a MaSA or MiSA in the downstream-most area of the population creates a substantial gap between this and the proximate downstream population.

B.1.a. Major life history strategies.
There are limited data to allow any comparisons between historic and current life history strategies. The IDFG classifies adult spawners as spring run. The known major juvenile life history strategy is a spring yearling migrant. No natural or anthropogenic impacts that could have resulted in loss of a life history strategy are known to have occurred. It appears all historic juvenile and adult life history strategies are present, but because data is limited the metric is rated *Low Risk.*

B.1.b. Phenotypic variation.
There is no data to indicate that any phenotypic traits have been significantly changed or lost. No alterations of within-basin habitat conditions that could have resulted in loss of a phenotypic trait are known to have occurred. No major selective pressures exist which would cause significant changes in or loss of traits. Changes in the mainstem migration corridor (lower Snake and Columbia rivers) likely have altered timing of juvenile downstream passage and adult upstream passage. Because smolt entry into the estuary is substantially delayed relative to historic conditions, this metric is rated at *Low Risk.*

B.1.c. Genetic variation.
Genetic ratings were based on IC-TRT analysis of allozyme data presented in Waples et al. 1993. In addition, the IC-TRT analyzed WDFW and R. Waples, unpublished allozyme data, and P. Moran, unpublished microsatellite data. Within the Upper Salmon River group of populations North Fork Salmon River samples differentiated from other populations however, one of three years of samples was similar to hatchery samples. There is moderate inter-annual variation among samples. This metric was rated *Low Risk.*

B.2.a. Spawner composition.
Spawner composition typically is determined from spawning ground carcass recoveries. Any marked fish that are recovered are examined for the presence of a coded-wire or PIT tag. Spawner carcass data collected within this population is extremely limited. Risk ratings are inferred from data collected in proximate populations. From 1981 through 2004 3,955 marked fish were recovered in the upstream Upper Salmon River population (at Sawtooth Fish Hatchery) and a CWT was extracted and read from 3,932 of those fish. From 1980 through 2004 551 marked fish were recovered in the upstream Pahsimeroi River population (at Pahsimeroi Fish Hatchery) and a CWT was extracted and read from all fish.

(1) *Out-of-ESU strays*. In the upstream Upper Salmon River Mainstem population, four out-of-ESU strays were recovered at the Sawtooth Hatchery across the 23 years of data reviewed. Two were fall Chinook that had been reared in the Hagerman Valley, one was a stray from the Tucannon River and one was a stray from the Umatilla River. In the Pahsimeroi population, one out-of-ESU fish was trapped in 1984; its origin was the Rogue River in Oregon. No expansions were done to account for unmarked returns from the respective mark groups. This sub-metric is rated *Very Low* risk since the total number of out-of-ESU strays observed was very low.

(2) *Out-of-MPG strays from within the ESU*. Five out-of-MPG strays were recovered at the Sawtooth Hatchery across the 23 years of data reviewed. Two of the strays were Rapid River origin and two were South Fork Salmon River origin. Four out-of-MPG strays were recovered at the Pahsimeroi Fish Hatchery over 24 years of data surveyed. All were Rapid River stock; two (one each in 1988 and 1999) were reared and released at Rapid River and two (one each in 1976 and 1977) were reared in a facility on Hayden Creek (tributary to the Lemhi River). No expansions were done to account for unmarked returns from the respective mark groups. This sub-metric is rated *Low* risk.

(3) *Out of population within MPG strays*. Out-of-population hatchery-origin strays that could enter the population in recent years would originate from the upstream Upper Salmon River Mainstem population (Sawtooth Hatchery) or the Pahsimeroi Hatchery program operated in the Pahsimeroi River population. Proportion of strays spawning naturally is suspected to be less than 10% per year, and this sub-metric is rated *Low Risk*.

(4) *Within-population hatchery spawners.* There is no within population hatchery program, and this sub-metric is rated *Very Low* risk.

The overall risk rating for metric B.2.a “spawner composition” is *Low Risk* even no out-of-population strays have actually been observed. In 1977 at total of 45,360 hatchery Chinook salmon fry were released into the North Fork Salmon River. It is unlikely enough adults returned from this release to influence the population.

B.3.a. Distribution of population across habitat types.

The North Fork Salmon River population intrinsic potential distribution historically was distributed across three EPA level IV ecoregions, with South Clearwater Forested Mountains being predominant. The current distribution is similar to the historic intrinsic distribution (Table 3 and Fig. 6). There are no substantial changes in ecoregion occupancy even though the current distribution extends into two ecoregions not historically occupied. This metric was rated *Very Low Risk* for the population.

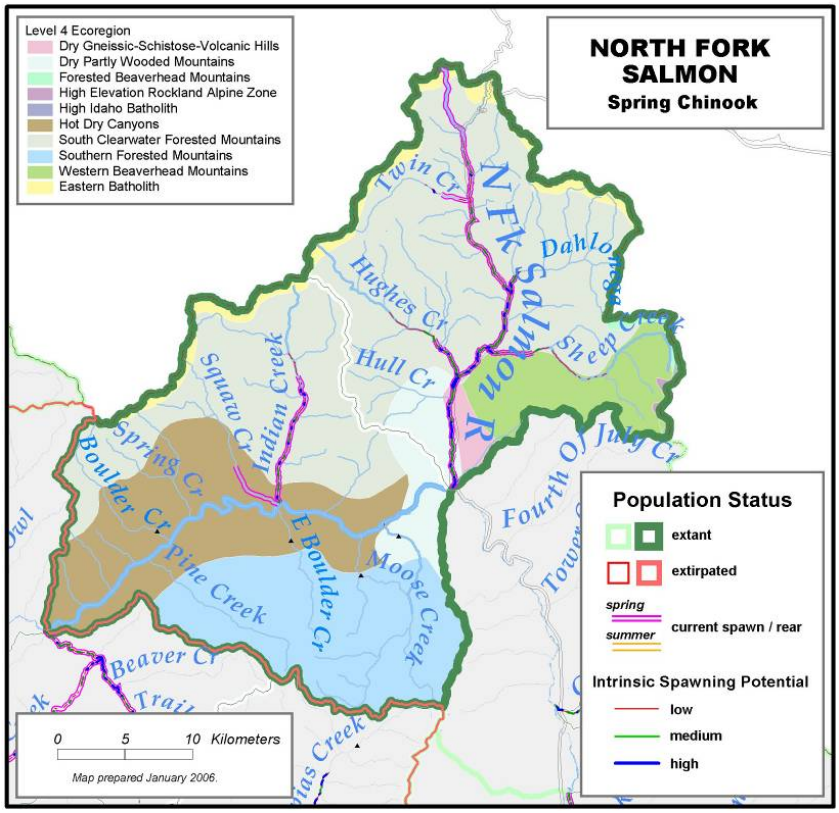

Figure 3. North Fork Salmon chinook population distribution across various ecoregions.

Table 2. North Fork Salmon chinook—proportion of spawning areas across various ecoregions.

Ecoregion	% of historical branch spawning area in this ecoregion (non-temperature limited)	% of historical branch spawning area in this ecoregion (temperature limited)	% of currently occupied spawning area in this ecoregion (non-temperature limited)
Dry Gneissic-Schistose Volcanic Hills	17.6	17.6	10.6
Dry Partly Wooded Mountains	32.5	32.5	22.6
South Clearwater Forested Mountains	49.9	49.9	62.5
Hot Dry Canyons	0.0	0.0	1.8
Western-Beaverhead Mountains	0.0	0.0	2.4

B.4.a. Selective change in natural processes or selective impacts.

Hydropower system: The hydrosystem and associated reservoirs impose some selective mortality on smolt outmigrants and adult migrants, the selective mortality is not likely to remove more than 25% of the affected individuals. The likely impacts are rated as *Low Risk* for this action.

Harvest: Recent harvest impact rates for spring/summer Chinook salmon are generally less than 10% annually. There are no freshwater fisheries directly targeting naturally produced spring/summer Chinook salmon; indirect mortalities are expected to occur in some fisheries selective for hatchery fish. In 2005 there was a limited sport fishery in the mainstem Salmon River just downstream of the Pahsimeroi River to target marked hatchery summer Chinook salmon returning to Pahsimeroi Fish Hatchery. Some indirect mortalities were expected to occur through the execution of the fishery. It is not likely that the mortality is selective for a particular group of fish or if it is, it would not select 25% or more of that particular group and this action is as *Very Low Risk*.

Hatcheries: There are no hatchery programs within this population and hatchery programs in proximate populations are not suspected to have a selective impact on this population. The selective impact of hatchery actions was rated as *Low* risk.

Habitat: Habitat changes resulting from land use activities in the basin may impose some selective mortality, but the extent is unknown. It is likely that any selective mortality impacts would affect a non-negligible portion of the population. The effects of land use activities upstream of the population boundary likely does not impose selective mortality on this population. This selective impact was rated *Low Risk*.

Spatial Structure and Diversity Summary

Overall spatial structure and diversity has been rated *Low Risk* for the North Fork Salmon River population (Table 3). The lowest spatial structure/diversity risk level the population could achieve would be Low risk because of the historic (natural) number and spatial arrangement of spawning areas (only one MaSA).

Spatial Structure and Diversity Summary

Table 3. Spatial structure and diversity scoring table

<table>
<tr><th rowspan="2">Metric</th><th colspan="5">Risk Assessment Scores</th></tr>
<tr><th>Metric</th><th>Factor</th><th>Mechanism</th><th>Goal</th><th>Population</th></tr>
<tr><td>A.1.a</td><td>H (-1)</td><td>H (-1)</td><td rowspan="3">Low Risk
(Mean=0.67)</td><td rowspan="3">Low Risk</td><td rowspan="14">Low Risk</td></tr>
<tr><td>A.1.b</td><td>VL (2)</td><td>VL (2)</td></tr>
<tr><td>A.1.c</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.1.a</td><td>L (1)</td><td>L (1)</td><td rowspan="3">Low Risk</td><td rowspan="10">Low Risk</td></tr>
<tr><td>B.1.b</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.1.c</td><td>L (1)</td><td>L (1)</td></tr>
<tr><td>B.2.a(1)</td><td>VL (2)</td><td rowspan="4">Low Risk</td><td rowspan="4">Low Risk</td></tr>
<tr><td>B.2.a(2)</td><td>L (1)</td></tr>
<tr><td>B.2.a(3)</td><td>L (1)</td></tr>
<tr><td>B.2.a(4)</td><td>VL (2)</td></tr>
<tr><td>B.3.a</td><td>VL (2)</td><td>VL (2)</td><td>Very Low Risk</td></tr>
<tr><td>B.4.a</td><td>L (1)</td><td>L (1)</td><td>Low Risk</td></tr>
</table>

Overall Viability Rating

The North Fork Salmon River spring/summer Chinook salmon population does not currently meet population-level viability criteria (Fig. 4). Abundance/productivity status cannot be determined because no data is available. The abundance/productivity status is tentatively rated at High Risk, consistent with the seven populations in the Upper Salmon River MPG where data were available to determine risk status. Improvement in abundance/productivity status (reduction of risk level) most likely will need to occur before the population can be considered viable. Also, the population currently does not meet the criteria for a "maintained" population. It is questionable as to whether or not the population could ever achieve highly viable status because of spatial structure constraints.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	
	High (>25%)		**North Fork Salmon River**		

Figure 4. Viable Salmonid Population parameter risk ratings for the North Fork Salmon chinook population. This population does not currently meet viability criteria. ***Viability Key: HV – Highly Viable; V – Viable; M – Maintained; Shaded cells-- not meeting viability criteria (darkest cells are at greatest risk)***

Table 4. Spring/summer Chinook salmon redds counted in transects on the North Fork Salmon River since 1952. Data obtained from Idaho Department of Fish and Game database.

	Mouth to Twin Creek (27.8 km)					Mouth to Dahlonega Creek (18.6 km)			NF Ranger Station to Twin Cr (16.8 km)			Mouth to Pierce Creek (29.3 km)					
	Mouth to Hughes Creek	Hughes Creek to North Fork Ranger Station	North Fork Ranger Station to Dahlonega Creek	Dahlonega Creek to Twin Creek	r/km	Mouth to North Fork Ranger Station	North Fork Ranger Station to Dahlonega Creek	r/km	North Fork Ranger Station to Dahlonega Creek	Dahlonega Creek to Twin Creek	r/km	Mouth to North Fork Ranger Station	North Fork Ranger Station to Dahlonega Creek	Dahlonega Creek to Pierce Creek	r/km	Hughes Creek to Johnson Gulch	Grand Total
km->	8.51	2.42	7.65	9.18		10.93	7.65		7.65	9.18		10.93	7.65	10.73			
t-km->	27.76					18.58			16.83			29.31					
1952	17 (to headwaters, 39.35 km)																17
1957	100		95		7.0												195
1958	11	11	41		2.3												63
1960	91			0	3.3												91
1961	15	129		0	5.2												144
1962	22	62		1	3.1												85
1963						19	52	3.82									71
1964						29	57	4.63									86
1965						5											5
1966						70		3.77									70
1967						66		3.55									66
1968						145		7.8									145
1969	10		72	83	5.9												165
1970									28	67	5.64						95
1971									40	13	3.15						53
1972									8	23	1.84						31
1973									32	23	3.27						55
1974									13	5	1.07						18
1975									8	6	0.83						14
1976									3	3	0.36						6
1977									16	15	1.84						31
1978									19	10	1.72						29
1991												8			0.27		8
1992												12			0.41		12
1993												17			0.58		17
1994												0	3	0	0.1		3
1995												0	1	0	0.03		1
1996												5			0.17		5
1997												10			0.34		10
1998												3			0.1		3
1999												2			0.07		2
2000																11	11
2001												102			3.48		102
2002												36			1.23		36
2003												36			1.33		39
2004												42			1.43		42
2005												20			0.68		20
2006												21			0.72		21

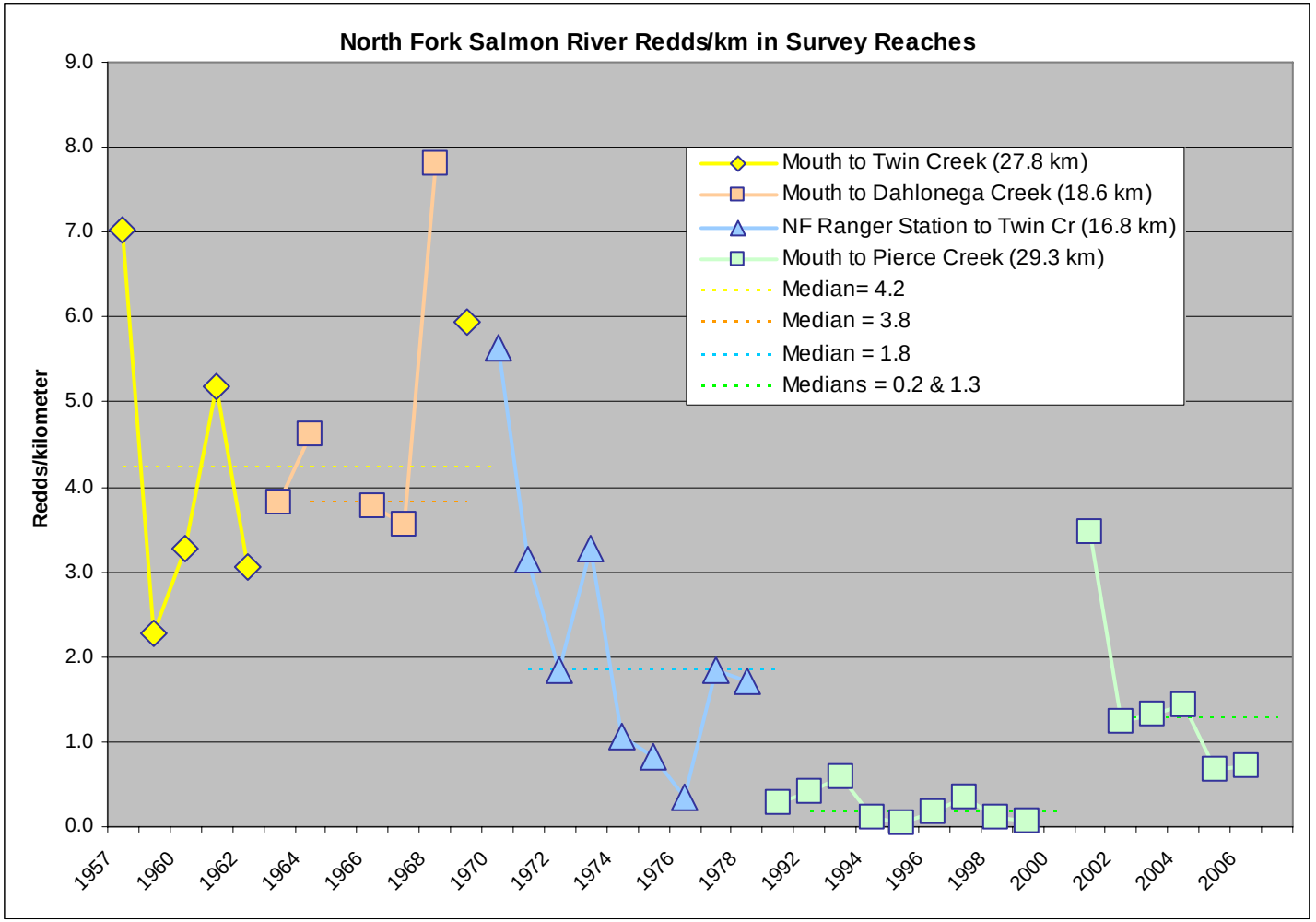

Figure 5. Spring/summer Chinook salmon redd densities (redds/kilometer) in reaches of the North Fork Salmon River.